REMARKS

Entry of the foregoing, re-examination and reconsideration of the subject matter identified in caption, as amended, in light of the remarks which follow, are respectfully requested.

Claim 26 has been added. Claim 26 is supported by the specification, at least page 18, line 24 to page 19, line 5. Applicants advise that methyl methacrylate has a glass transition temperature of 105°C, which temperature is usually regarded as a softening temperature.

Upon entry of the Amendment, claims 1-26 will be all of the claims pending in the application.

I. Response to Rejections under 35 U.S.C. § 103(a)

a. Claims 1-12 and 15-23 were rejected under 35 U.S.C. §103(a) as obvious over Japanese Patent Document No. 05-295807 to Kunihiro et al. ("JP '807") in view of U.S. Patent No. 4,778,851 to Henton et al.

b. Claims 13, 14, 24 and 25 were rejected under 35 U.S.C. § 103(a) as obvious over JP '807, U.S. Application Publication No. 2007/0122742 to Kato et al. and Henton et al., and further in view of Japanese Patent Document No. 63-179323 to Nobumasa et al. ("JP '323").

Applicants respectfully submit that the claims are patentable over the cited references for at least the following reasons.

Independent claim 1 recites a liquid crystal sealing agent composition that is a one-component light and heat-curable resin composition comprising:

(1) a solid epoxy resin having a softening temperature by the ring and ball method of 40°C or above;

(2) an acrylate monomer and/or a methacrylate monomer, or an oligomer thereof;

(3) a thermoplastic polymer having a softening temperature by the ring and ball method of 50 to 120°C, the thermoplastic polymer being obtained by copolymerizing an acrylate monomer and/or a methacrylate monomer with a monomer copolymerizable therewith;

(4) a light-activated radical polymerization initiator; and

(5) a latent epoxy curing agent.

In this composition, the thermoplastic polymer having a softening temperature of 50 to 120°C can melt and compatibilize, i.e., (1) a solid epoxy resin with (2) an acrylate monomer and/or a methacrylate monomer, or oligomer thereof, and further swell the compatibilized thermoplastic polymer, thereby preventing the constituents of the liquid crystal sealing agent composition from exuding and diffusing into the liquid crystal, as described at page 18, lines 3-14, of the present specification.

JP '807 discloses a liquid crystal sealing agent that is a one-component light and heat-curable resin comprising:

(a) a partial acrylized or a partial methacrylized epoxy resin;

(b) an acrylate or a methacrylate, or an oligomer thereof;

(c) a solid epoxy resin with a softening point above 40°C;

(d) a light-activated radical polymerization initiator; and

(e) a latent epoxy curing agent.

As the Examiner conceded, JP '807 does not disclose a composition including a thermoplastic polymer having a softening temperature by the ring and ball method of 50 to 120°C, which is obtained by copolymerizing an acrylate monomer and/or a methacrylate monomer with a monomer copolymerizable therewith, as defined in present claim 1.

Henton et al. discloses toughening a wide variety of epoxy resins by adding thermoplastic grafted rubber particles having a core-shell structure. In a preferred embodiment, the grafted rubber particles comprise an acrylate core and an ethyl acrylate/methacrylic acid copolymer shell and maintain a substantially constant morphology during curing conditions.

It was asserted that "[i]t is noted that the curing temperature disclosed by [JP '807] is as low as 100°C ... It would have been obvious to one of ordinary skill in the art at the time of invention to include a thermoplastic component with a softening point above the handling and processing temperatures as taught by Henton et al. in order to improve the roughness of component (c)" (a solid epoxy resin) disclosed by JP '807.

JP '807 describes, in all of the working examples, that a liquid crystal composition is cured at 120°C. Therefore, even if JP '807 and Henton et al. are combined, as suggested by the Examiner, the combination still would not result in the subject matter of claim 1, because one would use thermoplastic grafted rubber particles having a softening temperature of more than 120°C in light of the totality of JP '807 and Henton et al.

Further, Applicants attach herewith a Declaration under 37 C.F.R. § 1.132 by Mr. Yasushi Mizuta, a co-inventor of the present application. The Declaration demonstrates the unexpectedly superior results obtainable by the claimed invention, thereby further supporting the patentability of the present claims.

Specifically, in the Declaration, two thermoplastic polymers having softening temperatures of 105 °C and 122 °C, respectively, were prepared. Liquid crystal sealing agent composition Example 5 (P5) and Comparative Example 4 (C4) were prepared in the same manner as described in Example 1 of the present specification, using the above-mentioned two thermoplastic polymers having softening temperatures of 105 °C and 122 °C,

respectively. The formulations of P5 and C4 are summarized in following Table 1 along with those of P1-P4 and C1-C3 described in the present specification:

Table 1

Composition		Example					Comparative Example			
		P1	P2	P3	P4	P5	C1	C2	C3	C4
(1) Epoxy resin	Solid epoxy resin EOCN-1020-75	15	15	20	15	15		15	15	15
	Other epoxy resin EPICLON 830S						15			
(2) Acrylate monomer and/or methacrylate monomer, or oligomer thereof	BISCOAT 300	20		20	20	20	20	20	20	20
	BISCOAT 400		20							
(3) Thermoplastic polymer	Synthesis Example 1	15	15	15	15		15			
	Synthesis Example 2								15	
	Synthesis Example 5					15				
	Synthesis Example 6									15
(4) Light-activated radical polymerization initiator	IRGACURE 184	2	2	2	2	2	2	2	2	2
(5) Latent epoxy curing agent	AMICURE VDH-J	6	6	6	6	6	6	6	6	6
	CUREZOL 2E4 MZ-A	1	1	1	1	1	1	1	1	1
(6) Partially esterified epoxy resin	Synthesis Example 3	20	20	10		20	20	20	20	20
	Synthesis Example 4				20					
(7) Filler	SO-E1	20	20	20	20	20	20	35	20	20
Additive	KBM-403	1	1	1	1	1	1	1	1	1
Ratio of constituent (1) relative to 100 parts by weight of constituent (2)		75	75	75	75	75	0	75	75	75

P5 and C4 were then evaluated in the same manner as described in Example 1 of the present specification and the results thereof are summarized in following Table 2 along with those of P1-P4 and C1-C3 described in the present specification:

Table 2

Test item Example	EX. 1	EX. 2	EX. 3	EX. 4	EX. 5	Comp. EX. 1	Comp. EX. 2	Comp. EX. 3	Comp. EX. 4
Liquid crystal sealing agent composition	P1	P2	P3	P4	P5	C1	C2	C3	C4
Viscosity stability	A	A	A	A	A	A	A	C	A
Glass transition temperature of light cured product (℃)	86	88	86	83	89	55	59	—	92
Gel fraction of heat cured product (%)	82	88	86	83	84	78	55	—	91
Cell gap size stability test	A	A	A	A	A	B	B	—	A
Bonding strength after light curing (MPa)	5.1	3.1	4.0	4.2	4.9	4.8	0.1	—	3.2
Bonding strength after light and heat curing (MPa)	20.2	17.5	19.0	17.8	19.0	16.0	1.2	—	15.0
Display characteristics test of liquid crystal display panel	A	A	A	A	A	B	C	—	A
Display characteristics test of shaded area of liquid crystal display panel	A	A	A	A	A	B	C	—	B

As can be seen from the data in above Table 1, liquid crystal sealing agent composition Examples 1 and 5 have the same formulations as Comparative Examples 2-4, except for the thermoplastic polymers therein. Specifically, Example 1 contains a thermoplastic polymer having a softening temperature of 80°C, and Example 5 contains a thermoplastic polymer having a softening temperature of 105°C, both of which are in accordance to the subject matter defined in claim 1. On the other hand, Comparative

Example 2 does not contain a thermoplastic polymer component; Comparative Example 3 contains a thermoplastic polymer having a softening temperature of 40°C, which is outside the range of 50 to 120°C recited in claim 1, and Comparative Example 4 contains a thermoplastic polymer having a softening temperature of 122°C, which is also outside the range recited in claim 1.

As can be seen from the results in above Table 2, Examples 1 and 5 exhibited results superior to Comparative Example 2 in terms of glass transition temperature of light cured product, gel fraction of heat cured product, cell gap size stability test, bonding strength after light curing, bonding strength after light and heat-curing, display characteristics test of liquid crystal display panel and display characteristics test of shaded area of liquid crystal display panel. In addition, Examples 1 and 5 exhibited results superior to Comparative Example 3 at least in terms of viscosity stability. Furthermore, Examples 1 and 5 exhibited results superior to Comparative Example 4 in terms of bonding strength after light and heat-curing, and display characteristics test of shaded area of liquid crystal display panel.

Neither JP '807 nor Henton et al. discloses or suggests these superior results obtainable with the liquid crystal sealing agent composition recited in claim 1.

In addition, Kato et al. is relied upon as merely disclosing the softening point for EOCN-1025. Further, JP '323 is relied upon as disclosing a method for preparing a liquid crystal display element without allowing air bubbles to remain in the liquid crystal by dropping a required amount of weighed liquid crystal on the inside of the sealing agent and thereafter curing the sealing agent. Neither Kato et al. nor JP '323 rectifies the deficiencies of JP '807 and Henton et al. Therefore, even if JP '807 and Henton et al. are combined with Kato et al. and JP '323, as suggested by the Examiner, the combination still would not result in the subject matter of claim 1.

In view of the foregoing, Applicants respectfully submit that claim 1 is not obvious over the cited references, and thus the rejections should be withdrawn. Further, claims 2-25 and new claim 26 depend from claim 1, directly or indirectly, and thus are patentable over the cited references at least by virtue of their dependency.

II. Conclusion

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order and such action is earnestly solicited. If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned at (202) 452-7932 at his earliest convenience.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: April 7, 2008

By: _____

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